

What is claimed is:

1. An object taking-out apparatus for taking out an object, using a robot having a robot arm and controlled by a robot controller, comprising:  
a hand attached to a distal end of the robot arm and having holding means for holding an object; and  
orientation changing means provided at said hand, for changing orientation of said holding means to selectively take one of a plurality of orientations including a first orientation and a second orientation different from each other in accordance with a command from the robot controller.
2. An object taking-out apparatus according to claim 1, wherein the first orientation is set such that a direction of a holding axis of said holding means is closest to a direction of a rotational axis of the distal end of the robot arm in the plurality of orientations to form a predetermined angle not equal to zero degree between the direction of the holding axis and the direction of the rotational axis of the distal end of the robot arm.
3. An object taking-out apparatus according to claim 2, wherein a center of holding by said holding means is offset from an axis of a proximal portion thereof.
4. An object taking-out apparatus according to claim 1, wherein an angle equal to or less than 45 degrees is formed between a holding axis of said holding means and a rotational axis of the distal end of the robot arm when said holding means takes the first orientation.
5. An object taking-out apparatus according to claim 4, wherein an angle substantially equal to 90 degrees is formed between the holding axis and

the rotational axis of the distal end of the robot arm when said holding means takes the second orientation.

6. An object taking-out apparatus according to claim 1, further comprising a visual sensor for detecting a condition of placement of an object, wherein said orientation changing means changes the orientation of said holding means according to the detected condition before holding the object.

7. An object taking-out apparatus according to claim 1, further comprising a visual sensor having means for storing taught image models of an object as seen from different directions, and means for comparing a captured image of the object with the taught image models and for selecting one of the taught image models according to a degree of conformity,

wherein said orientation changing means changes the orientation of said holding means according to the selected taught image model before holding the object.

8. An object taking-out apparatus according to claim 1, further comprising a visual sensor for detecting condition of overlapping of objects, wherein a holding position of the object by said holding means is changed according to the detected condition.

9. An object taking-out apparatus according to any one of claims 6 through 8, wherein said visual sensor has image capturing means attached to the distal end of the robot arm through a slider mechanism movable in directions away from and toward the distal end of the robot arm, and said image capturing means is moved in the direction away from the distal end of the robot arm when capturing an image, and moved in the direction toward the distal end of the robot arm when said holding means holds the object.

10. An object taking-out apparatus for taking out an object, using a robot having a robot arm, comprising:

a hand attached to a distal end of the robot arm and having holding means for holding an object, a center of holding by said holding means being offset from a center axis of a proximal portion thereof; and

orientation changing means provided at said hand, for changing orientation of said holding means to selectively take one of a plurality of orientations including a first orientation and a second orientation different from each another.

11. An object taking-out apparatus according to claim 10, wherein an angle equal to or less than 45 degrees is formed between a direction of a holding axis of said holding means and a rotational axis of the distal end of the robot arm when said holding means takes the first orientation.

12. An object taking-out apparatus according to claim 11, wherein an angle substantially equal to 90 degrees is formed between the direction of the holding axis and the rotational axis of the distal end of the robot arm when said holding means takes the second orientation.

13. An object taking-out apparatus according to claim 10, further comprising a visual sensor for detecting a condition of placement of an object, wherein said orientation changing means changes the orientation of said holding means according to the detected condition before holding the object.

14. An object taking-out apparatus according to claim 10, further comprising a visual sensor having means for storing taught image models of an object as seen from different directions, and means for comparing a captured image of the object with the taught image models and for selecting one of the

taught image models according to a degree of conformity,

wherein said orientation changing means changes the orientation of said holding means according to the selected taught image model before holding the object.

15. An object taking-out apparatus according to claim 10, further comprising a visual sensor for detecting condition of overlapping of objects, wherein a holding position of the object by said holding means is changed according to the detected condition.

16. An object taking-out apparatus according to any one of claims 13 through 15, wherein said visual sensor has image capturing means attached to the distal end of the robot arm through a slider mechanism movable in directions away from and toward the distal end of the robot arm, and said image capturing means is moved in the direction away from the distal end of the robot arm when capturing an image, and moved in the direction toward the distal end of the robot arm when said holding means holds the object.

17. An object taking-out apparatus for taking out an object, using a robot having a robot arm, comprising:

a hand attached to a distal end of the robot arm; and

holding means provided at said hand, for holding an object,

wherein a center of holding by said holding means is offset from a center axis of a proximal portion thereof and a predetermined angle not equal to zero degree is formed between a direction of a holding axis of said holding means and a rotational axis of the distal end of the robot arm.

18. An object taking-out apparatus according to claim 17, further comprising a visual sensor for detecting condition of overlapping of objects,

wherein a holding position of the object by said holding means is changed according to the detected condition.

19. An object taking-out apparatus according to claim 18, wherein said visual sensor has image capturing means attached to the distal end of the robot arm through a slider mechanism movable in directions away from and toward the distal end of the robot arm, and said image capturing means is moved in the direction away from the distal end of the robot arm when capturing an image, and moved in the direction toward the distal end of the robot arm when said holding means holds the object.

20. An object taking-out apparatus according to claim 17, further comprising a visual sensor having image capturing means attached to the distal end of the robot arm through a slider mechanism movable in directions away from and close to the distal end of the robot arm,

wherein said image capturing means is moved in the direction away from the distal end of the robot arm when capturing an image, and moved in the direction toward the distal end of the robot arm when said holding means holds the object.